accelerated in the early 1980s, its share of the performance total rose to 73.4 percent in 1985.

From 1985 to 1994, R&D performance grew by only 1.1 percent per year in real terms for all sectors combined. This growth was not evenly balanced across sectors, however. R&D performance at universities and colleges (including their FFRDCs) grew by 4.1 percent per year in real terms, compared with 0.7 percent real annual growth for industry, a decline of 0.7 percent per year for Federal intramural performance, and growth of 2.9 percent per year for nonprofit organizations (including their FFRDCs).

The period from 1994 to 1998 witnessed dramatic changes in these growth rates. Total R&D performance, in real terms, averaged 5.8 percent growth per year—substantially higher than in the earlier sluggish period. Yet R&D performance at universities and colleges (including their FFRDCs) grew by only 2.5 percent per year in real terms. Industry R&D performance (including their FFRDCs) grew at a remarkable rate of 7.6 percent in real terms. (See figure 2-7.) Federal intramural performance declined by 0.6 percent per year in real terms. Nonprofit organizations (including their FFRDCs), according to current estimates, saw their R&D increase by only 2.0 percent per year in real terms over the same four-year period.

According to preliminary estimates, in 1998 academia (including FFRDCs) accounted for 14.0 percent of total U.S. R&D performance, Federal intramural activities 7.6 percent, other nonprofit organizations (including FFRDCS) 3.0 percent, and private industry (including FFRDCS) 75.4 percent. (See text table 2-1.)

Federal R&D Performance

The Federal Government, excluding FFRDCs, performed $17.2 billion of total U.S. R&D in 1998. This figure was slightly higher than the level for 1997 ($16.8 billion), which reflected only 1.2 percent growth after adjusting for inflation. Federal agencies accounted for 7.6 percent of the 1998 national R&D performance effort—continuing the gradual decline, since 1972, of Federal performance as a percentage of total R&D.

DOD has continued to perform more Federal intramural R&D than any other Federal agency; in fact, in 1998 it performed more than twice as much R&D as the next-largest R&D- performing agency, HHS (whose intramural R&D is performed primarily by NIH). (See text table 2-4.) DOD's intramural R&D performance has grown by less than 1 percent per year in real terms since FY 1980, however, reaching a level of $7.8 billion in FY 1998. Furthermore, an undetermined amount of DOD's intramural R&D ultimately appears to be contracted out to extramural performers. NASA's intramural R&D has grown by 1.7 percent per year in real terms since 1980, to $2.5 billion in FY 1998, while HHS intramural performance has grown by 3.7 percent, to $3.0 billion.[19] Together, these three agencies accounted for 77 percent of all Federal intramural R&D in FY 1998. (See text table 2-4.)

Total R&D performed by industrial, academic, and nonprofit FFRDCs combined reached $8.7 billion in 1998, which is essentially the same as its level of $8.4 billion in 1997 after adjusting for inflation. R&D at FFRDCs in 1998 represented 3.8 percent of the national R&D effort; most of this R&D ($5.5 billion in 1998) was performed by university- and college-administered FFRDCs.

Industrial R&D Performance

Recent Growth in Industrial R&D

R&D performance by private industry reached $171.3 billion in 1998, including $2.4 billion spent by FFRDCs administered by industrial firms. This total represented a 7.6 percent increase over the 1997 level of $157.5 billion—which, in turn, reflected a smaller, though still notable, real gain of 6.9 percent over 1996.

In 1998, R&D performed by industry that was not Federally financed rose 8.7 percent in real terms above its 1997 level. Overall, private companies (excluding industry-administered FFRDCs) funded 86.8 percent ($146.7 billion) of their 1998 R&D performance, with the Federal Government funding nearly all of the rest ($22.2 billion, or 13.2 percent of the total). Between 1997 and 1998, there was little or no change, in real terms, in Federal funds for these industrial R&D activities. As recently as 1987, the Federal funding share of industry's performance total (excluding FFRDCs) was 31.9 percent; however, the Federal share of industry's performance has been steadily declining since its peak of 56.7 percent in 1959. Much of that decline can be attributed to declines in Federal funding to industry for defense-related R&D activities.

R&D in Manufacturing Versus Nonmanufacturing Industries

The tendency for R&D to be performed more by large firms than small firms is greater in the manufacturing sector than in the nonmanufacturing sector. However, within each of these two sectors there is considerable variation in this regard, depending on the type of industry. Among industrial categories, those in which most of the R&D is conducted by large firms include aircraft and missiles, electrical equipment, professional and scientific instruments, transportation equipment (not including aircraft and missiles), and transportation and utilities (which is in the nonmanufacturing sector). (See text table 2-10.) In these sectors, however, much of the economic activity overall is carried out by large firms; consequently, the observation that most of the R&D in these sectors is conducted by large firms is not surprising.

Probably the most striking change in industrial R&D performance during the past two decades is the nonmanufacturing sector's increased prominence. Until the 1980s, little attention was paid to R&D conducted by nonmanufacturing companies, largely because service sector R&D activity was negligible compared to the R&D operations of companies in manufacturing industries.

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[19]This increase represents the overall effect on intramural R&D for the agency, which takes into account the Social Security Administration (SSA) becoming a separate agency from HHS during fiscal year 1995. That is, the percentage increase reported would be larger, though negligibly, if HHS in 1995 had been defined as excluding SSA, as it is in 1996.

Text table 2–8.
Total (company, Federal, and other) funds for industrial R&D performance and number of R&D-performing companies in manufacturing and nonmanufacturing industries, by size of company: 1997

Distribution by size of company (Number of employees)		Funds for industrial R&D (Dollars in millions)	
Number of employees	Total	Manufacturing	Nonmanufacturing
Total	$157,539	$121,025	$36,514
Fewer than 500	24,063	8,248	15,815
500 to 999	4,966	2,905	2,061
1,000 to 4,999	19,590	14,300	5,289
5,000 to 9,999	14,266	11,670	2,596
10,000 to 24,999	21,510	16,874	4,636
25,000 or more	73,144	67,028	6,116
		Number of R&D-performing companies	
Total	35,112	18,130	16,982
Fewer than 500	31,995	15,898	16,097
500 to 999	1,127	886	241
1,000 to 4,999	1,302	938	364
5,000 to 9,999	322	197	125
10,000 to 24,999	199	138	61
25,000 or more	167	73	94

SOURCE: National Science Foundation, Division of Science Resources Studies (NSF/SRS), *Survey of Industrial Research and Development, 1997.*

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Prior to 1983, nonmanufacturing industries accounted for less than 5 percent of the industry R&D total. By 1993, this percentage had risen to an all-time high of 26 percent. It has fallen only slightly since then and has remained above 22 percent.[20] (See text table 2-9 and figure 2-13.)

In 1997, nonmanufacturing firms' R&D performance totaled $36.5 billion—$32.4 billion in funds provided by companies and other non-Federal sources and $4.1 billion in Federal support. (See appendix tables 2-53 and 2-54.) The large upswing in the percentage of nonmanufacturing R&D primarily reflects a sharp rise in company-supported nonmanufacturing R&D from 1987 to 1991. (See figure 2-13.) Moreover, the recent drop in this percentage in 1995–97 is attributable not to any decrease in the level of R&D from nonmanufacturing companies but to a sharp increase in company-supported R&D by manufacturing firms.

Because of recent changes in classification, little historical information exists regarding the decomposition of R&D for all nonmanufacturing firms into nonmanufacturing industrial categories. In 1997, however, the largest component of R&D for nonmanufacturing companies was R&D performed by computer and data processing services, which accounted for 8.5 percent of all industrial R&D performance. (See text table 2-9.) Wholesale and retail trade account for another 6.0 percent, and engineering and management services account for 4.4 percent. The "research, development, and testing"

[20]As a result of a new sample design, industry R&D statistics since 1991 better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries than they had previously. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years.

Text table 2–9.
Percentage share of total company and other non-Federal funds, by selected R&D-performing industries

	1987	1997
All manufacturing industries	91.6	75.7
Industrial and other chemicals (except drugs and medicines)	8.7	5.3
Drugs and medicines	6.7	8.7
Petroleum refining and extraction	3.1	1.2
Machinery	17.2	13.8
Electrical equipment	17.0	17.0
Motor vehicles and motor vehicles equipment	11.7	10.3
Aircraft and missiles	9.7	4.2
Professional and scientific instruments	8.1	6.7
All nonmanufacturing industries	8.4	24.3
Communications services	1.7	1.4
Computer and data processing services	NA	8.5
Research, development, and testing	0.9	3.6
Wholesale and retail trade	NA	6.0
Engineering and management services	NA	4.4
Health services	NA	0.5
Finance, insurance, and real estate	NA	1.1

NA = not available

SOURCE: National Science Foundation, Division of Science Resources Studies, *Survey of Industrial Research and Development, 1997.*

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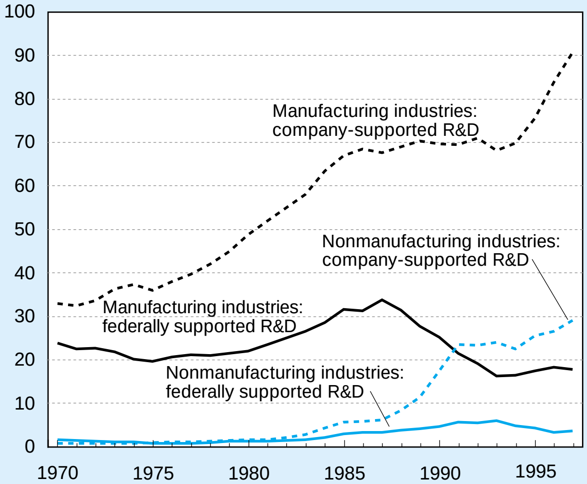
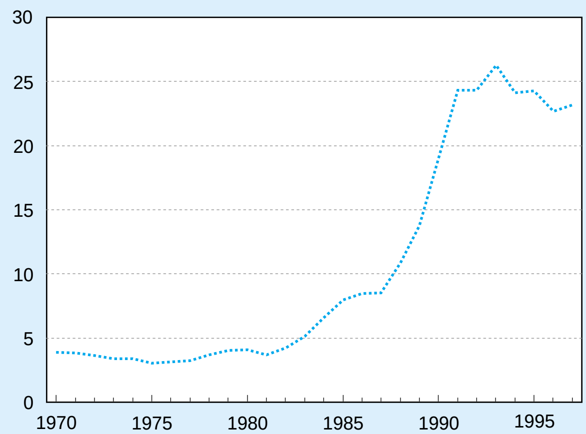
Figure 2-13.
Industrial R&D performance, by manufacturing and nonmanufacturing industries



Nonmanufacturing R&D performance as a percentage of total industrial performance



See appendix table 2-52.

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sector accounted for 3.6 percent of total industrial R&D; communications services for 1.4 percent; and finance, insurance, and real estate services for 1.1 percent.

Although a great deal of R&D in the United States is related in some way to health services, companies that are specifically categorized in the health services sector accounted for only 0.5 percent of all industrial R&D and only 2 percent of all R&D by nonmanufacturing companies. These figures illustrate that R&D data disaggregated according to standard industrial categories (including the distinction between manufacturing and nonmanufacturing industries) may not always reflect the relative proportions of R&D devoted to particular types of scientific or engineering objectives or to particular fields of science or engineering.[21] (The analysis in "R&D in Chemistry, Life Sciences, and Information Technology" compensates to some extent for this limitation in the data by providing R&D expenditure levels associated with these fields.)

On average, industrial manufacturing R&D performers are quite different from industrial nonmanufacturing R&D performers. Nonmanufacturing R&D is characterized as having many more small R&D firms than manufacturing R&D performers. (See text table 2-10.) Approximately 35,000 firms in the United States perform R&D, of which 18,000 are manufacturers and 17,000 are in the nonmanufacturing sector—nearly a 50-50 split. Yet manufacturers account for 77 percent of total industry performance (including Federally funded industry performance). The main reason for this continued dominance of the manufacturing sector is simply that among manufacturing firms, the largest (in terms of number of employees) tend to perform a relatively large amount of R&D. Among small R&D-performing firms (fewer than 500 employees) in manufacturing and nonmanufacturing sectors, those in the nonmanufacturing sector tend to conduct twice as much R&D per firm as those in the manufacturing sector. Among large R&D-performing firms (more than 25,000 employees) in both sectors, however, those in the manufacturing sector tend to conduct more than 10 times as much R&D per firm as those in the nonmanufacturing sector.

Top 20 U.S. Corporations in R&D Spending

Of the top 20 U.S. corporations in R&D expenditures in 1997 (see text table 2-11), only one—Microsoft Corporation, which had 22 thousand employees—had fewer than 25 thousand employees. The corporation that performed the most R&D in 1997 was General Motors ($8.2 billion); another company in the motor vehicle sector, Ford Motor Company, performed $6.3 billion in R&D. The next three corporations were IBM, Lucent Technologies, and Hewlett-Packard ($4.3, $3.1, and $3.1 billion in R&D, respectively). All of the top 20 corporations were associated with motor vehicle manufacturing, computers, communication equipment, or pharmaceuticals—with the exception of Procter and Gamble, which fell into the category of "other chemicals (soaps, ink, paints, fertilizers, explosives…)."[22]

[21] For a more detailed discussion of limitations in the interpretation of R&D levels by industrial categorization, see Payson (1997).

[22] These data on R&D for individual corporations were obtained from a source that is different from the NSF Survey of Industrial Research and Development—namely, from the U.S. Corporate R&D database, as provided by Shepherd and Payson (NSF 1999e). Consequently, the definition of R&D in this case is not equivalent to that in the Industry R&D Survey. In particular, the U.S. Corporate R&D database derives from R&D reported in the Standard and Poor's *Compustat* database. As such, these R&D figures include R&D conducted by these companies outside the U.S., whereas the Industry R&D Survey includes only R&D performed within the U.S. Because of this difference in the data and other differences as outlined in NSF1999e, R&D data appearing in text table 2-11 and appendix table 2-58 should not be used in conjunction with R&D data originating from NSF's Industry R&D Survey.

Text table 2–10.
Industry R&D performed by different size firms, for selected sectors: 1997
(Dollars in millions)

Industry	Sectors with more than 50 percent R&D performed by large firms (with over 25 thousand employees)	Size of company in terms of the number of employees						
		Total	Fewer than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
All Industries		**157,539**	**24,063**	**4,966**	**19,590**	**14,266**	**21,510**	**73,144**
Manufacturing		121,025	8,248	2,905	14,300	11,670	16,874	67,028
Aircraft and missiles	X	16,296	(D)	(D)	173	599	(D)	15,331
Drugs and medicines		11,589	234	54	2,047	2,207	3,737	3,311
Electrical equipment	X	24,585	1,789	854	3,628	3,114	1,953	13,248
Fabricated metal products		1,798	451	(D)	205	189	455	(D)
Food, kindred, and tobacco products		1,787	101	65	265	391	262	703
Lumber, wood products, and furniture		348	74	22	77	96	79	0
Office, computing, and accounting machines		12,840	830	(D)	1,375	904	2,952	(D)
Primary metals		988	47	22	146	233	(D)	(D)
Professional and scientific instruments	X	13,458	1,109	686	2,300	989	652	7,722
Stone, clay, and glass products		608	16	31	72	103	386	0
Transportation equipment (except aircraft and missiles)	X	15,697	(D)	(D)	115	247	(D)	14,537
Nonmanufacturing		36,514	15,815	2,061	5,289	2,596	4,636	6,116
Services		22,400	11,074	(D)	3,252	1,344	3,205	(D)
Transportation and utilities	X	3,013	56	22	138	70	128	2,598

D = data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation, Division of Science Resources Studies (NSF/SRS), *Survey of Industrial Research and Development, 1997.*

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Text table 2–11.
The 20 leading industrial R&D companies, ranked by size of R&D expenditures in 1997

Rank	Company	R&D expenditures (millions)	Sales (millions)	Number of employees	Percent change in R&D from the previous year	Industrial category
1	General Motors Corp	8,200.0	168,190	608,000	–7.87	Motor vehicles & motor vehicle equipment
2	Ford Motor Co	6,327.0	153,627	363,892	–7.24	Motor vehicles & motor vehicle equipment
3	Intl Business Machines Corp	4,307.0	78,508	269,465	9.48	Electronic computers and computer terminals
4	Lucent Technologies Inc	3,100.6	26,360	134,000	68.69	Modems & other wired telephone equipment
5	Hewlett-packard Co	3,078.0	42,895	121,900	13.25	Electronic computers and computer terminals
6	Motorola Inc	2,748.0	29,794	150,000	14.79	Radio, TV, cell phone, and satellite communication eq.
7	Intel Corp	2,347.0	25,070	63,700	29.81	Electronic components (semiconductors, coils…)
8	Johnson & Johnson	2,140.0	22,629	90,500	12.34	Drugs: pharmaceutical preparations
9	Pfizer Inc	1,928.0	12,504	49,200	14.49	Drugs: pharmaceutical preparations
10	Microsoft Corp	1,925.0	11,358	22,232	34.43	Prepackaged software
11	Boeing Co	1,924.0	45,800	238,000	60.33	Aircraft, guided missiles & space vehicles
12	Chrysler Corp	1,700.0	58,622	121,000	6.25	Motor vehicles & motor vehicle equipment
13	Merck & Co	1,683.7	23,637	53,800	13.21	Drugs: pharmaceutical preparations
14	American Home Products Corp	1,558.0	14,196	60,523	9.02	Drugs: pharmaceutical preparations
15	General Electric Co	1,480.0	88,540	276,000	4.15	Electrical equipment (industrial & household)
16	Bristol Myers Squibb	1,385.0	16,701	53,600	8.54	Drugs: pharmaceutical preparations
17	Lilly (Eli) & Co	1,382.0	8,518	31,100	16.18	Drugs: pharmaceutical preparations
18	Abbott Laboratories	1,302.4	11,883	54,487	8.10	Drugs: pharmaceutical preparations
19	Procter & Gamble Co	1,282.0	35,764	106,000	5.00	Other chemicals (soaps, ink, paints, fertilizers, explosives)
20	Pharmacia & Upjohn Inc	1,217.0	6,710	30,000	–3.87	Drugs: pharmaceutical preparations

SOURCE: National Science Foundation, Division of Science Resources Studies (NSF/SRS), *U.S. Corporate R&D. Volume II. Company Information on Top 500 Firms in R&D* by C. Shepherd and S. Payson. NSF 00-302. Arlington, VA: NSF.

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R&D Intensity

In addition to absolute levels of, and changes in, R&D expenditures, another key indicator of the health of industrial science and technology is R&D intensity. R&D is similar to sales, marketing, and general management expenses in that it is a discretionary (i.e., non-direct-revenue-producing) item that can be trimmed when profits are falling. There seems to be considerable evidence, however, that R&D enjoys a high degree of immunity from belt-tightening endeavors—even when the economy is faltering—because of its crucial role in laying the foundation for future growth and prosperity. Nevertheless, whether industry devotes the right amount of economic resources to R&D has remained an open question. (See sidebar, "Does Industry Under-Invest in R&D?")

There are several ways to measure R&D intensity; the one used most frequently is the ratio of R&D funds to net sales.[23] This statistic provides a way to gauge the relative importance of R&D across industries and firms in the same industry.

The industrial sectors with the highest R&D intensities have been

- research, development, and testing services;
- computer and data processing services;
- drugs and medicines;
- office, computing, and accounting machines;

[23]Another measure of R&D intensity is the ratio of R&D to "value added" (which is sales minus the cost of materials). Value added is often used in studies of productivity analysis because it allows analysts to focus on the economic output attributable to the specific industrial sector in question, by subtracting materials produced in other sectors. For a discussion of the connection between R&D intensity and technological progress, see, for example, Nelson (1988) and Payson (in press).

Does Industry Under-Invest in R&D?

In a report published by the National Institute of Standards and Technology, Tassey (1999) suggests that private industry may be under-investing in R&D for the following reasons:

- **Technology is risky**, not only in terms of achieving a technological advance but in terms of acquiring the ability to market it first. For example, if one firm initiates the research and makes the important discoveries but another firm is able to market the new technology first, the firm that made the discovery would not recover its R&D costs. Consequently, although the economic returns to the second firm in this case would be very high—as would be the economic returns to society—the firm that initiates the effort may have good reason to be skeptical about its expected gains and may therefore be reluctant to initiate the work in the first place.
- **Spillovers from the technology** to other industries and to consumers, such as lower prices ("price spillovers") and increased general knowledge ("knowledge spillovers"), may bring many benefits to the economy as a whole, independent of the returns to the firm that performs the R&D. As Tassey notes, "To the extent that rates of return fall below the private hurdle rate, investment by potential innovators will not occur."
- **Inefficiencies result from market structures**, in which firms may face high costs of achieving comparability when they are competing against each other in the development of technological infrastructure. For example, software developers are constrained not only by the immediate development task at hand but in having to ensure that the new software they develop is compatible with software and operating systems that other firms may be developing simultaneously. Here, greater efforts undertaken by industry or government to encourage standardization of emerging technologies would likely lead to higher returns on R&D.
- **Corporate strategies**, according to Tassey, "often are narrower in scope than a new technology's market potential." In other words, companies in one line of business may not realize that the technological advances they make may have beneficial uses in other lines of business.* Thus, broader-based strategies that extend beyond a firm's immediate line of products would yield greater returns on R&D.
- **Technological infrastructure**, such as the Internet, often yields high returns to individual companies and to the overall economy but often requires substantial levels of investment before any benefits can be realized. This argument is similar to the public-goods argument that, for some large-scale R&D projects, funds from government or an organized collaboration of industry participants may be necessary for the project to achieve the "critical mass" it needs to be successful. Once a project is successful, however, high returns on R&D might be realized.

Solutions to these problems would not be simple, but NIST is addressing them. Among NIST's general goal in this regard is to encourage a "more analytically based and data-driven R&D policy" (Tassey 1999, 2).

* Levitt (1960) has referred to this kind of problem as "marketing myopia."

- optical, surgical, photographic, and other instruments;
- electronic components;
- communication equipment; and
- scientific and mechanical measuring instruments. (See text table 2-12 and appendix table 2-50.)

Among these sectors, the highest R&D intensity (38.5 percent in 1997) is observed in research, development and testing services (which is not surprising because, in this special case, R&D is the actual product sold rather than a means toward acquiring a better product or production process). Computer data and processing services are second, at 13.3 percent, followed by drugs and medicines at 10.5 percent.[24] The "office, computing, and accounting machines" sector had an R&D intensity as high as 12.3 percent in 1987, but its R&D intensity fell to 9.2 percent by 1997.

Text table 2–12.
Company and other (except Federal) industrial R&D funds as a percentage of net sales in R&D-performing companies for selected industries: 1987 and 1997

Industry and size of company	1987	1997
Manufacturing		
Drugs and medicines	8.7	10.5
Office, computing, and accounting machines.	12.3	9.2
Optical, surgical, photographic, and other instruments.	7.2	8.9
Electronic components	8.5	8.1
Communication equipment	5.5	8.0
Scientific and mechanical measuring instruments	8.1	6.5
Aircraft and missiles	3.6	3.9
Motor vehicles and motor vehicles equipment	3.4	3.8
Industrial chemicals	4.4	3.5
Other machinery, except electrical	3.0	3.0
Other electrical equipment	2.6	2.7
Radio and TV receiving equipment.	3.2	2.6
Other transportation equipment	2.5	2.2
Other chemicals	3.3	2.1
Stone, clay, and glass products	2.5	1.8
Fabricated metal products	1.2	1.5
Rubber products	1.6	1.4
Paper and allied products	0.6	1.1
Lumber, wood products, and furniture	0.6	0.9
Textiles and apparel.	0.4	0.9
Nonferrous metals and products	1.3	0.6
Petroleum refining and extraction	1.0	0.6
Ferrous metals and products	0.6	0.6
Food, kindred, and tobacco products	0.6	0.5
Nonmanufacturing		
Research, development, and testing services	5.5	38.5
Computer and data processing services	NA	13.3
Engineering, architectural, and surveying.	NA	2.6
Trade.	NA	2.4
Finance, insurance, and real estate.	NA	0.7
Telephone communications	NA	0.7
Electric, gas, and sanitary services	NA	0.1

NA = not available

SOURCE: National Science Foundation, Division of Science Resources Studies (NSF/SRS), *Survey of Industrial Research and Development, 1997*

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Sectors that were lowest in R&D intensity in 1997 included

- nonferrous metals and products;
- petroleum refining and extraction;
- ferrous metals and products;
- food, kindred, and tobacco products; and
- electric, gas, and sanitary services.

These sectors, in large part, reflect the "smokestack industries" that played a dominant role in the U.S. economy in the mid-1900s in terms of new directions of technological change.

Performance by Geographic Location, Character of Work, and Field of Science

R&D by Geographic Location

The latest data available on the state distribution of R&D performance are for 1997.[25] These data cover R&D performance by industry, academia, and Federal agencies, as well as Federally funded R&D activities of nonprofit institutions. The state data on R&D cover 52 records: the 50 states, the District of Columbia, and "other/unknown" (which accounts primarily for R&D for which the particular state was not known). Approximately two-thirds of the R&D that could not be associated with a particular state is R&D performed by the nonprofit sector. Consequently, the distribution of R&D by state indicates primarily where R&D is undertaken in Federal, industrial, and university facilities.

In 1997, total R&D expenditures in the United States were $211.3 billion, of which $199.1 billion could be attributed to expenditures within individual states; the remainder was "other/unknown." (See appendix table 2-20.) The statistics and discussion below refer to state R&D levels in relation to the distributed total of $199.1 billion.

R&D is concentrated in a small number of states. In 1997, California had the highest level of R&D expenditures performed within its borders ($41.7 billion, representing approximately one-fifth of U.S. total). The six states with the highest levels of R&D expenditures—California, Michigan, New York, New Jersey, Massachusetts, and Texas (in descending order)—accounted for approximately half of the entire na-

[24]R&D outlays in the semiconductor equipment and materials industry are estimated to be about 12–15 percent of sales (Council on Competitiveness 1996). The broad industry classification system used in NSF's industrial R&D survey can mask pockets of high-tech activity.

[25]Although annual data are available on the location of R&D performance by the academic and Federal sectors, until recently, NSF has conducted surveys on the state distribution of industrial R&D performance only in odd-numbered years. At this writing, the 1998 industry R&D survey data have not been processed, making 1997 the most recent year for which the state-specific R&D totals can be reported.